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DECEMBER 2, 1991

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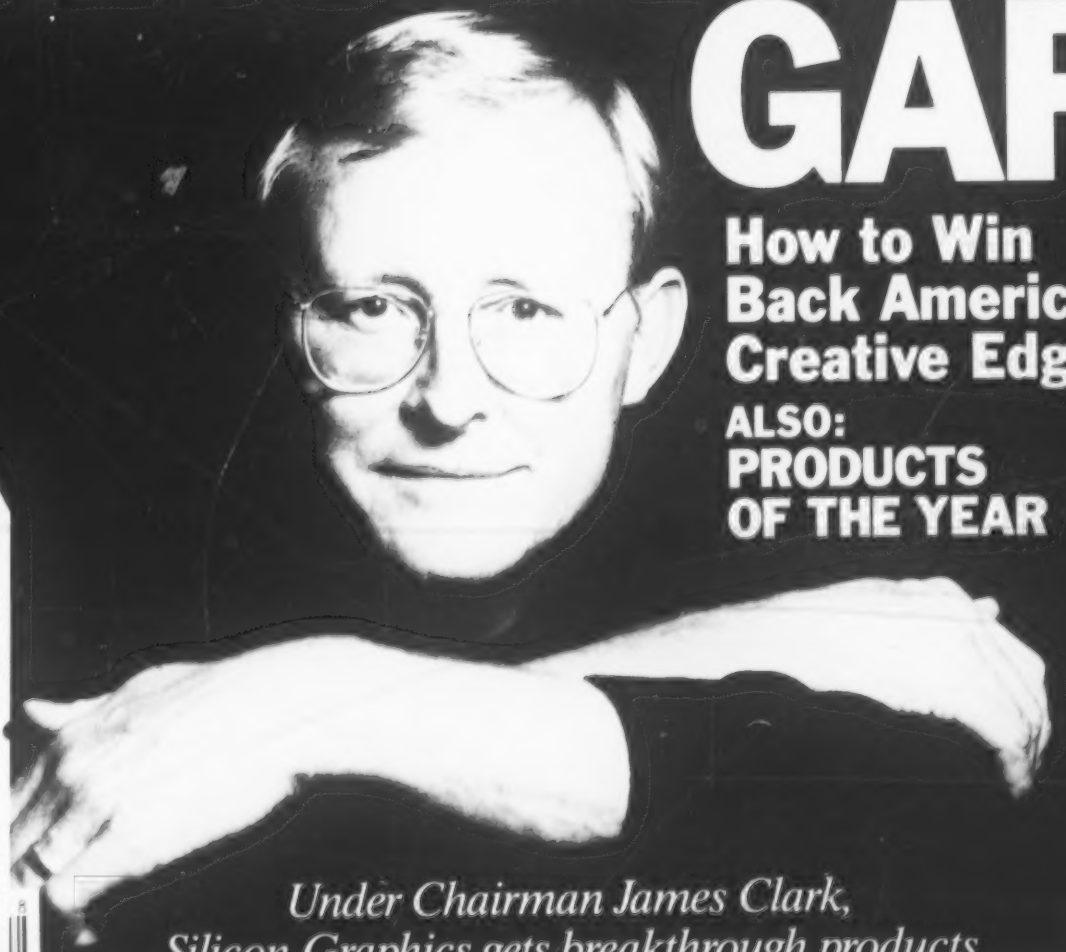
THE INNOVATION GAP

How to Win Back America's Creative Edge

ALSO:
PRODUCTS OF THE YEAR



Under Chairman James Clark, Silicon Graphics gets breakthrough products to market in just 18 months.

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FORTUNE

"Most American managers think there's some black magic and a new product appears, but in today's market you need a way to innovate on demand." PAGE 56

ABOVE: Laura Sistos of Amgen holds a daily dose of Neupogen, a genetically engineered drug for cancer patients. Photo by Dana Fineman (Sygma).

COVER: Fineman also took this photo of Clark, who left Stanford University ten years ago to start Silicon Graphics, now a $600-million-a-year computer maker.

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America isn't creating new products fast enough for global competition. Smart executives know that developing mold-breaking ideas isn't magic—it's a process you can manage. *by Brian Dumaine*

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"Confidence is not going to bounce back quickly. When you have the rug pulled out from under you, it sobers you up."

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"Twenty-five years ago people were lucky to survive heart attacks. Most men retired. There was no running, no sex."

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"Our business is reading signals from the customer day in and day out."

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"We are capable of producing 200% of Japan's demand for rice."

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"Adolf was an illiterate corporal, whereas I have graduated from two higher educational establishments."

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"It could be one of the best deals Trump ever got. He could write *The New Art of the Deal*."

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EDITOR'S DESK

Dumaine and Losee explore the dynamics of innovation with one of our products of the year.

FORTUNE has been compiling its annual list of the products of the year for over a decade now, but it's never been as hard to find standouts as it was this time. When Stephanie Losee undertook the project last August, repeated trips around the halls to ask staff about noteworthy innovations in industries they covered, and subsequent inquiries to new-product specialists, mostly produced responses along the lines of "Gosh . . . uh, let me think a minute . . . I'll have to get back to you on this." Losee, no tyro at spotting interesting new offerings—she wrote our Products to Watch department for almost a year—ended up talking to about 200 people before finally arriving at a list that met our criteria (see Managing). She blames the recession.

But maybe that isn't the only reason. Brian Dumaine first picked up on another possible explanation when interviewing industrial designers for a story a while back. "They were all bemoaning the state of innovation in America," he recalls. After looking into the facts and figures, he concluded that while the U.S. probably still has a lead in devising new products, the Japanese are gaining fast. There is a bright side to the story, though, as he points out in his article "Closing the Innovation Gap." Dumaine's reporting shows that the creative process can be managed to achieve success. For some of his examples of those who do it right, he went to—who else?—the people who created a couple of our products of the year.

Look, too, at the penetrating report international editor Don Holt and a team of writers, reporters, and designers have put together on "The New New Europe." Perhaps it's time for us all to begin learning German.

International editor Don Holt (center front) and his team took the measure of what could be the world's biggest economic powerhouse.

ASSISTANT MANAGING EDITOR

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BY TERENCE P. PARÉ

EUROPE'S STOCK MARKETS OFFER A PASSPORT TO PROFITS

■ Few events hold as much potential for gains as the coming economic unification of Europe. Though there are still plenty of stumbling blocks, analysts figure that a successful integration could add as much as 6.5% to the EC's gross domestic product over the rest of the decade. Then there is the expected gain from new trade with the old communist bloc. Notes Marcus Grubb, European Equity Strategist at UBS Phillips & Drew in London: "Europe will be one of the most profitable places to invest in the 1990s." (For more on Europe's prospects, see Special Report.)

European stocks tend to sell at slightly lower price-earnings multiples than American shares. But even that understates the value you get for your dollar. Old World accounting favors reporting lower earnings because of high corporate taxes. This keeps P/Es higher than they would otherwise be. When the stocks are measured on the more comparable basis of price to cash flow per share, European markets are even more of a bargain. The stock markets listed below sell at an average P/E that is 28% less than the average U.S. P/E. But the price to cash flow multiple of the European markets is a full 41% lower than the stateside multiple.

A Europe-bound investor has two ways to go: Buy single stocks through American Depositary Receipts (ADRs) or buy into an entire market through a closed-end country fund. These funds, which hold stocks of a particular country, have their own shares listed on a U.S. stock exchange. A sharp-eyed investor can often snare them when they are selling at a discount to net asset value (NAV), which is the value of the shares they hold in the portfolio. Says Michael Porter, Smith Barney's country fund analyst: "The name of the game is to invest in an undervalued market through a fund that is trading at a larger than normal discount to NAV." That way, he says, you have two ways to win.

Though Europe's economies have slowed lately, analysts are expecting a strong profit rebound in 1992 and beyond. The **Portugal Fund**, which is selling at a 6% discount to NAV, is just about the only easy way to get into one of the most promising markets in Europe. While the Portuguese economy has cooled somewhat from its torrid pace of recent years, its longer-term growth prospects remain superior to all other economies in the EC.

It's still old-style commerce in the Netherlands.

Spain, another bulb in the Garlic Belt, promises tasty returns as well. While enjoying 2.5% annual economic growth, Spain's government has managed to bring down inflation and reduce its budget deficit. Income from tourism, which stands at around $20 billion for 1991, should leap $7 billion next year on the back of the Barcelona Olympics. One likely beneficiary of spendthrift sports fans will be the **Growth Fund of Spain**, which trades for 10% less than its NAV.

There's a growing list of funds that offer single-country plays on France and Germany, the Continent's two biggest bourses. Of these, the **France Growth Fund** and the **New Germany Fund**, both selling at discounts, offer the cheapest ways in. Says Malcolm Clinger, chief investment officer of Swiss Bank Corp. in New York City: "Both markets are very promising."

Investors who hope for more bark from their mark may want to look at American Depositary Receipts for shares in individual German companies that stand to benefit from unification and from the reconstruction of Eastern Europe. **Mannesmann** is a favorite among Euro-analysts. The company builds machinery and factories; it is also the world's biggest and lowest-cost producer of oil pipes, with the largest potential customer in the world, Mother Russia.

A promising play in France, analysts say, is **Alcatel Alsthom**, the telecommunications equipment company. One of the two suppliers for the rebuilding of the East German

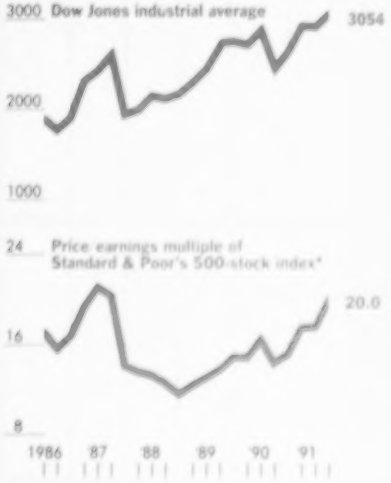
5 MARKETS TO BUY NOW

	EST. 1992 GDP GROWTH	STOCK MARKET* PRICE TO CASH FLOW MULTIPLE	STOCK MARKET* PRICE CHANGE last six months	BEST WAY TO PLAY
FRANCE	1.5%	5.9	7.5%	France Growth Fund
GERMANY	2.0%	4.7	-0.2%	New Germany Fund
NETHERLANDS	1.5%	5.8	1.5%	Royal Dutch/Shell and Unilever ADRs
PORTUGAL	2.9%	4.1	-13.2%	Portugal Fund
SPAIN	2.5%	5.1	0.1%	Growth Fund of Spain

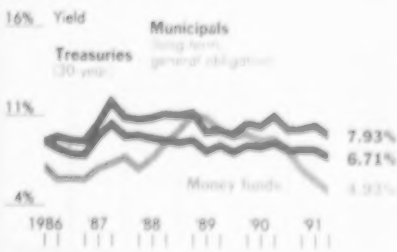
* Figures are calculated in U.S. dollars.

STATE OF THE MARKETS

Stocks



Bonds



Gold

11/7

This is FORTUNE's fortnightly look at the major markets of the past five years.

CHARTS SHOW END-OF-QUARTER FIGURES.

*BASED ON EARNINGS FOR THE LATEST FOUR QUARTERS.

SOURCES: STANDARD & POOR'S, BOND BUYER, DONOGHUE'S MONEY FUND REPORT, COMMODITY EXCHANGE

FORTUNE CHART

phone system, Alcatel recently formed a joint venture with a Polish company to supply telephone switching equipment. Anita Hibbert, an analyst at Smith New Court in London, thinks Alcatel's P/E of 8.6 times estimated 1992 earnings is too low, given the company's bright prospects. Alcatel's ADRs trade over the counter in the U.S.

Since no country fund exists for the Netherlands, you almost have to buy ADRs to invest there. The choice is simple: **Royal Dutch/Shell** by itself accounts for 40% of the market capitalization in the Netherlands. Analysts think the company can pump out 16% earnings growth next year. Prospects also look good for **Unilever**, an Anglo-Dutch food company. Just helping to feed the 139 million hungry souls in Eastern Europe, reckons Sylvain Massot, Morgan Stanley's food analyst in London, could add two to three percentage points to the annual earnings growth of big, brand-name food companies like Unilever over the next 20 years.

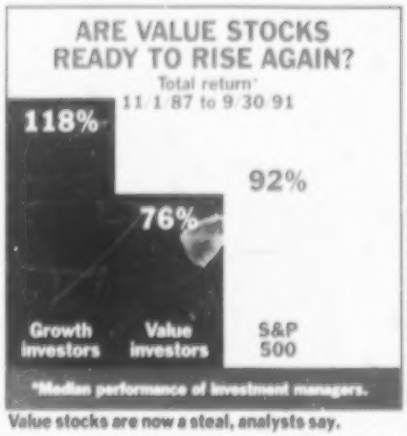
THE CASE FOR VALUE INVESTING NOW

■ Ever since the 1987 crash, growth stocks have been beating the tail off value plays, and managers who specialize in growth-stock investing are standing on top of the performance hill (see chart). But lately an increasing number of market seers say that value's day is about to return.

Value investors are used to long slumps between winnings. They tend to buy out-of-favor shares, typically those selling with high dividend yields or at low price/earnings multiples. Growth stock investors, on the other hand, will often pay a premium for companies that are expected to increase earnings much faster than average. They believe that high growth will more than make up for the higher price.

Both growth and value investing have ardent disciples, who insist their methods are the only strategies that can produce superior results. In fact, both can, but seldom in the same period. During much of the 1980s, value investing worked well as raiders went hunting for undervalued companies to buy and break up. Highflying healthy companies—growth stocks—were ignored.

After the crash of 1987, the relative performance of value stocks began to slip. The performance tables were completely turned in 1989, when the junk bond market ran into trouble and the takeover boom came to an end. According to Performance Evaluation Services, a Dallas fund-tracking service, growth stock mutual funds have outperformed value funds, 46.5% to 20.1%, since June 1989.



Value stocks are now a steal, analysts say.

Now value investing may be coming back into vogue. Research by Performance Analytics, a Chicago investment consulting firm, shows that the recent outperformance by growth stock managers and underperformance by value managers has been too extreme to last. "Never in the past 14 years has growth done so well and value done so poorly," says Robert Moseson, president of the firm.

The quarter that ended September 30 was the worst of the past 55 quarters for value-oriented money managers. By contrast, managers of funds investing in growth stocks with large capitalizations posted better numbers in only three of the last 55 quarters. Whenever the results are that divergent, a performance flip-flop is inevitable, says Moseson: "I think we will be hearing the swan song of growth stocks within the next two quarters."

Roger Hertog, who heads Sanford C. Bernstein's $16.5 billion asset management group, which is known for its strict adherence to value investing, agrees. According to the firm's analysis, value stocks are cheaper today than at any time in the 1980s. "There is plenty of work for the value investor to do right now," he says. "We expect to begin a significant positive cycle for undervalued stocks."

Investors looking to catch the rise of value stocks have many mutual funds to

CLOSING THE INNOVATION GAP

America isn't creating new products fast enough for global competition. Smart executives know developing mold-breaking ideas isn't magic—it's a process you can manage. ■ *by Brian Dumaine*

RON ZAROWITZ had an idea. Struggling to hook up a car seat for his 2-year-old daughter one day in the early Eighties, he realized that a fold-down version of such a seat could be built right into the car and offered as an option. When he became a manager at Chrysler in 1985, he was well situated to push the idea—and did he ever push it. "I brought the idea up over and over again, and every time they said, 'Why would we want to do this?'" he recalls. Scores of memos followed, and top management at last agreed to discuss the idea in 1987. "It was in the discussion phase for the next two years," says Zarowitz. The first built-in child seats appeared this fall, six years after Zarowitz proposed them, as a $200 option in 1992 Chrysler minivans. The company says it's selling them as fast as it can make them—after missing the opportunity for years.

U.S. industry isn't innovating nearly as well as it should be at a time when innovation has become more important than ever. Listen to James Clark, 47, who left a professorship at Stanford ten years ago to start Silicon Graphics, now a $600-million-a-year computer maker and one of the fastest-growing and most innovative companies in the world: "We're losing our creative edge. American industry is on the decline because U.S. managers are too concerned about protecting short-term earnings to innovate."

While the U.S. still generates more patents than any other nation, other countries, especially you-know-where, are catching up fast. A new study by the Haddon Heights, New Jersey, consulting firm CHI Research found that since 1983 Japan has gained and the U.S. has lost share in total patents in 38 of 48 product categories, particularly in office computers, electronics, transportation equipment, and shipbuilding. While U.S. R&D spending has been dragging along at about 2% of GNP, the Japanese have dra-

Terminator 2 got special effects help from Silicon Graphics, where James Clark keeps killer schedules.

REPORTER ASSOCIATE Stephanie Losee

matically increased their spending, which recently reached 3% (see chart on next page). The U.S. spent $100 billion in 1989, vs. Japan's $58 billion, for R&D outside the defense sector.

PATENT AND R&D statistics are a good indicator of where the U.S. stands in the world, but nothing says more about America's shaky will to create than its obsession with line extensions. U.S. managers everywhere seem to be taking baby steps, launching safe variations of existing products rather than going for truly new products and entering new markets. Line extensions can make a lot of money, but Honey Nut Cheerios and Diet Cherry Coke are probably not the path to world economic leadership. Says C. K. Prahalad, a University of Michigan professor and author of an upcoming book on methods for innovation: "The global and competitive battles of the 1990s will be won by companies that can get out of traditional and shrinking product markets by building and dominating fundamentally new markets." Further, as new technology spreads ever faster, even advanced products (such as personal computers) quickly become like commodities bought solely on price. So coming up with the genuinely new becomes all the more important.

How can America close the gap between the lead it ought to have in innovation and the shaky edge it now holds? Part of the problem is that innovation is risky, and taking risks is expensive in America. While interest rates look low at the moment, the truth is they've been remarkably high in recent years after adjusting for inflation and still are (see Economic Intelligence). High real rates force managers to avoid gambles that might be worthwhile if the stakes were lower and to bypass projects that don't promise a fast payback—projects that other nations, with lower real rates, will tackle.

Perhaps worse, a capital gains tax higher than in virtually any other developed country slashes the rewards of successful innovation. An adventurous startup that doubled in value over the past decade would provide its investors with a return, after inflation and the capital gains tax, of just over 1% annually. Under those rules, why bother?

Fine, you say, but unfortunately I can't change interest rates or the capital gains tax. What *can* I do? You can begin by dismissing the common American view that innovation is some kind of mysterious, divinely inspired miracle that just happens (or doesn't).

Ron Zarowitz finally sold Chrysler on his idea of built-in child seats—after six years of dogged effort.

The best companies see innovation as a function that needs managing—and then they manage it by basing new products on customers' needs, encouraging employees to use the expertise of the whole company, giving workers incentives for successful innovation, and refusing to punish those whose gambles don't pay off. One key lesson: Good ideas don't go very far unless they are nurtured and developed. Smart managers understand that meeting these challenges is more important than increasing R&D spending or building Taj Mahal–size technical centers. Says Robert Johnston, a partner of IdeaScope, a Cambridge, Massachusetts, consulting firm specializing in innovation: "Most American managers think there's some black magic and then a new product appears, but in today's market you need a way to innovate on demand."

It's easy to share the belief that there's something not strictly rational about innovation, for inventing a drop-dead new offering is a tricky business. According to Thomas Kuczmarski, a Chicago consultant specializing in innovation, only one of every 20 or 25 ideas ever becomes a successful product—and of every ten or 15 new products, only one becomes a hit.

An essential part of a creative culture is for people to lead the consumer, not follow him.

But that doesn't mean you can't inject a little science into the process. Kuczmarski and other top consultants say corporations need a dual approach. First they must create cultures where new ideas can thrive, and then they must set up systems that will winnow those ideas through development and into the market with lightning speed. A soon-to-be-released study of corporate innovation practices by the Arthur D. Little consulting firm shows that U.S. executives' greatest concern about innovation is not a lack of brilliant scientists and engineers—America still has the best—but a dearth of managers who know how to drive the creative process.

The Japanese are showing how to create cultures that foster innovation. Says James Swallow, a consultant at A.T. Kearney who recent-

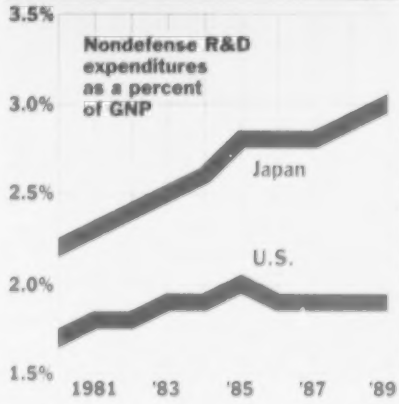
Photographs by Dana Fineman—Sygma

ly finished a study of 14 top U.S. and Japanese companies: "The Japanese were more consistent across the board in their innovation practices. They plan like demons, execute brilliantly, and yet are constantly asking how they can do better."

Peter F. Drucker, professor of social science and management at the Claremont Graduate School, noted after a recent trip that the Japanese are reorganizing their R&D so that a single team of engineers, scientists, marketers, and manufacturers works simultaneously at three levels of innovation. At the lowest level they seek incremental improvements of an existing product. At the second, they try for a significant jump, such as Sony's move from the micro tape recorder to the Walkman. The third is true innovation. As Drucker writes, "The idea is to produce three new products to replace each present product, with the same investment of time and money—with one of the three then becoming the new market leader and producing the innovator's profit."

But structure alone won't do the job. Companies need to teach their people better ways to come up with new ideas. Successful innovators like Sony, Rubbermaid, and Silicon Graphics believe you have to start with a clear vision of where you want to be ten, 20, or 30 years from now. Sony chairman Akio Morita argues that while American companies struggle to create a vision for the next quarter, Japanese companies have a vision for the next decade.

JAPAN VS. THE U.S. IN R&D ...



An essential part of a creative culture is teaching people to lead the consumer, not follow him. The result is products like Sony's diminutive Data Discman (see Products of the Year), developed after a Sony product team reasoned that executives and others would like to carry huge amounts of data with them while traveling. The process is what Robert Hall, senior vice president of GVO, a Palo Alto, California, industrial design firm, calls "needs analysis." As Hall says, "To invent products out of thin air, you don't ask people what they want—after all, who would have told you ten years ago that they needed a CD player? You ask them what problems they have when they get up in the morning."

FOR YEARS, Johnson Controls of Milwaukee, which makes climate control systems for office buildings, competed on price against rivals like Honeywell. Engineer Hugh Hudson set up a formal needs-analysis program in 1987; he and a team of eight engineers and marketers spent two years traveling Europe, Asia, and the U.S. to learn more about their customers' future requirements.

At the end of their sojourn, Hudson found to his surprise that his customers were more concerned about the total cost of installing and maintaining a Johnson system than with its initial price. When an old system broke, it was hard and expensive to fix. You had to shut down the heat or air conditioning in the whole building and then disconnect a lot of wires, facing a danger of electrocution. To change that, Hudson and his team designed an entirely new system called Metasys. Now to fix a problem, a building owner need only pull out a gray plastic module and slip in a new one—no screwdrivers or tools necessary.

Though Metasys costs more to make than the old system, it costs less to install and is easier to maintain. Introduced in January 1990, it brought in $500 million of revenues in its first year. What about its effect on the industry? A Dean Witter report downgraded competitor Honeywell's stock based in part on the market share gains by Johnson's new system.

But judging the customer zeitgeist can be enormously difficult; you must always be on the lookout for countertrends, complications, and shifts. Campbell Soup found this out with its Souper-Combo frozen food line. The company thought it had a great idea—take its famous soup, add a sandwich, and make both microwaveable for busy moms and dads. The company conducted enormous amounts of testing, talking with retailers and consumers, letting them taste different samples. The tests showed that people loved the idea, so Campbell launched Souper-Combo in 1989.

Rubbermaid borrowed a molding technique from its cooler business to create this line of furniture.

This January the company killed the product. What happened? Campbell missed an important, emerging trend. Consumers wanted healthier foods. As Campbell was rolling out Souper-Combo, competitors launched a number of low-fat, low-salt, frozen microwaveable foods that pushed Souper-Combo off the shelves. Says Elizabeth Senior, Souper-Combo's project director: "We learned we have to apply more personal judgment, insight, and thought to what we see around us. We have to keep our antennae up."

RUBBERMAID TEACHES its people to let ideas flow out of its so-called core competencies, the things it does best. Bud Hellman, who used to run a Rubbermaid subsidiary, was touring one of the company's picnic-cooler plants in the late Eighties when he suddenly realized he could use its plastic blow-molding technique to make a durable, lightweight, and inexpensive line of office furniture. The result was the WorkManager System, which the company says accounts for 60% of its furniture division sales. Says Charles Hassel, a member of the product development team: "If top management hadn't encouraged us to look at processes and technologies elsewhere in the company, none of this would have ever happened."

Toro, a Bloomington, Minnesota, maker of mowers and other lawn equipment, fosters individual innovation by letting it be known that risk takers won't be penalized for new ideas that fail. A team of young engineers thought they could save time and money by using an experimental molding technique to make the metal hoods on Toro's sit-down lawn mowers. After adding the process to the assembly line, the engineers found it didn't work well at high production levels—and Toro lost a year of mower sales. When CEO Kendrick Melrose summoned the engineers to his office, they thought it was pink-slip city. But when they walked in they saw ribbons and balloons on the walls and a cake to celebrate the risk they took. Nor was the engineers' gamble a total loss: the company is using the molding process on other products where it works better.

Another way Toro fosters innovation: The company keeps an independent inventor on retainer. Bob Comer has worked under contract for 23 years and likes the fact that his independence keeps him out of office politics. Says he: "It's a real stimulant." In 1983 the company asked him to improve its aerator for golf greens. An aerator is a machine that uses metal pipes to punch holes in the ground, loosening the soil and helping the grass to grow. The problem is that aerators make a mess, leaving small plugs of dirt all over the greens. Golf courses typically must close for up to a week and lose lots of revenue while they clean up all the little dirt cylinders.

Toro pays inventor Bob Comer for breakthrough ideas such as this water-injecting golf green aerator.

In an impressive leap of imagination, Comer figured that if he used jets of water to poke holes in the green there would be nothing to clean up. How did he think of that? "You never know why or how the flash comes. It just does." After a few years of tinkering, he came up with the Black Widow, a prototype the size of a small truck with wires and hoses extending from it like the legs of a spider. Launched last year, Toro's HydroJect is outselling the competition 2 to 1. If he wasn't independent, Comer might have long ago succumbed to office naysaying. Says he: "Mostly what I do is never used. But that doesn't bother me. My job lets me work in a never-never land."

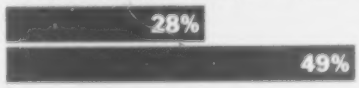
The top innovative companies know that the greatest idea in the world won't earn a dime if it isn't taken beyond the concept stage properly—and many U.S. companies don't seem to know what to do with good ideas. As Johnson Controls' Hugh Hudson puts it, "Most companies fail in execution. It's what separates the Japanese from us. You can have the best technology in the world, but if you don't execute well, forget it."

To spur new ideas, Bell Atlantic started what it calls its Champion program. Any employee with a good idea gets to leave his job for a while at full pay and benefits and receive training in such skills as writing a

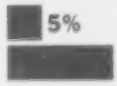
... AND IN NEW PRODUCTS

Japanese spend more time planning ...

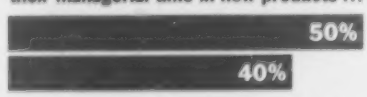
... suffer development setbacks in a smaller proportion of products ...



... and waste less of their time debugging finished products.



Japanese companies invest more of their managerial time in new products ...



... and receive more revenues from them.

business plan and organizing a development schedule; he also gets money to invest in the idea. He becomes the idea's champion, with a strong incentive to develop it successfully: He can invest 10% of his salary in the project and give up his bonus in return for 5% of the revenues (subject to certain caps) if the product gets to market. Champion has generated two patents with 11 more pending since the company started the program in 1989. It has produced a successful new device for trouble-shooting telephone switching problems and a phone that's small enough to fit in your ear.

ONE OF THE MOST common development problems is that by the time a product gets to market, it looks little or nothing like the original idea that so excited everyone. At every step people try to change the idea, adding their own improvements and sometimes unintentionally making the product worse. To avoid such meddling, the Japanese spend more time than Americans do in planning. Once everyone decides what the product is—its features, color, shape, price—the company sticks to those specs. A.T. Kearney's study showed that because Japanese companies spend more time planning new products than Americans do, they experience far fewer interruptions during development and fewer problems after launch.

Chrysler, the company that resisted Ron Zarowitz's idea for so long, has learned some lessons about development. Glenn Gardner heads the giant LH project, which is developing a whole new line of cars scheduled for delivery next year, and endorses the Japanese approach of settling on specifications as late as possible and then sticking to them. The way people can spend more time planning, discussing, and debating the product's characteristics—and afterward, everyone knows that a change would seriously delay the project. Gardner says that since he adopted this method, top management has yet to intercede with a major change, the first time that has happened in his 30-plus years in the auto industry.

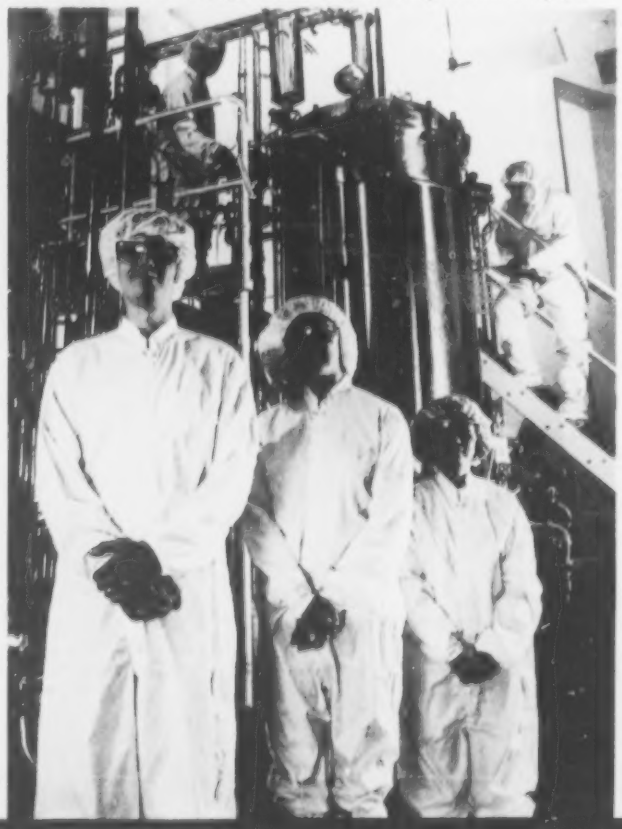
With global competition red hot, rushing new products to market is more important than ever. Silicon Graphics uses a rigorously scheduled process that has enabled it to develop and launch most of its breakthrough products in less than 18 months. The company closes each project down the second it is finished and goes on to the next. That way Silicon Graphics' high-strung engineers, who like to be constantly challenged, don't have to linger after the launch to fiddle with this feature or that. It keeps their interest high. Says Tom Jermoluk, Silicon Graphics' executive VP and head of product development: "Forget the incremental stuff. Go 95% of the way and launch. If you wait until you get 100% of what you want, you'll surely get beat to market by the competition."

Japanese companies settle on specs as late as possible—and then stick to them.

Even with that kind of compromise, the company gets impressive results. Silicon Graphics makes high-powered computers that run software designed for a multitude of purposes. Plastic surgeons, for instance, can redesign a person's face on a screen to see what he would look like after an operation. Moviemaker George Lucas's Industrial Light & Magic used a company system to create the spectacular special effects for Arnold Schwarzenegger's megahit, *Terminator 2*. One of the company's computers that cost $75,000 in 1989 was succeeded 18 months later by a new system, just as fast, for under $10,000.

Amgen supercharges development by getting people to focus on how their product affects the world. This Thousand Oaks, California, biopharmaceutical firm makes Neupogen, a genetically engineered drug that helps prevent infections in cancer patients and is another of FORTUNE's Products of the Year. Amgen employees passing company bulletin boards constantly see letters from parents of smiling kids who used the drug during clinical trials and now are out of the hospital and back in school.

These workers make Neupogen, which Amgen developed remarkably fast.



While most pharmaceuticals companies need two or three months after FDA approval to launch a new drug, Amgen got its lifesaver into patients' hands in a mere 48 hours. This meant spending $150,000 to hire a jet to airlift Neupogen from the company's bottling plant to its distribution center. Says Mike Narachi, the leader of the Neupogen product development team: "We lost some money on the jet, but we got a lot of mileage out of our morale."

Despite the lessons of the best innovators, most managers continue to think innovating is just a matter of turning the spigot labeled R&D. That's not enough. As the University of Michigan's Prahalad says, "More money on R&D is money down a rat hole if you don't change the process." And the sooner you start managing the process better, the sooner you'll find that innovation more than pays for itself. F

EUROPE'S GROWING MARKET

By the turn of the century we will be talking about Greater Europe, one huge trading area of 450 million people living in at least 25 countries from Finland to Portugal to Bulgaria. The main trading bloc right now is still the dozen-member European Community. The baker's dozen outside want in. First in line is the European Free Trade Association, or EFTA, comprising six countries that already do nearly 60% of their trade with the EC. EFTA has just approved a pact that virtually integrates its members into the Common Market. Two EFTA countries, Austria and Sweden, are seeking full EC membership. Next are Czechoslovakia, Hungary, and Poland, which have agreed to open their markets to EC products within ten years. In the rear are Albania, Bulgaria, Romania, and Yugoslavia. Though they have various trade agreements with the EC, they need to develop their home markets first.– **Sara Hammes**

EUROPEAN COMMUNITY

1990 data in each table	BELGIUM	BRITAIN	DENMARK	FRANCE	GERMANY	GREECE	IRELAND	ITALY	LUXEMBOURG	NETHERLANDS
Population in millions	9.9	57.2	5.1	56.4	79.5	10.0	3.5	57.7	0.38	14.9
GNP in billions	$197.1	$979.9	$125.5	$1,190.2	$1,648.8	$67.3	$37.1	$1,077.5	$8.9	$278.0
GNP per capita	$20,013	$17,119	$24,426	$21,088	$20,740	$6,697	$10,600	$18,687	$23,560	$18,608
Inflation rate	3.4%	9.5%	2.6%	3.4%	2.7%	20.4%	3.4%	6.5%	3.7%	2.5%
Trade balance in millions	–$1,769	–$31,131	$4,566	–$13,954	$65,230	–$10,178	$3,977	$723	N.A.	$10,466
Persons per TV set	3.2	3.0	2.7	2.5	2.6	5.7	3.8	3.9	4.0	3.2

[1]GDP. [2]GDP per capita. [3]Estimate. [4]West Germany only.

Linked With EC Through a Free-Trade Agreement

	AUSTRIA	FINLAND	ICELAND	NORWAY	SWEDEN	SWITZERLAND
Population in millions	7.7	5.0	0.25	4.2	8.6	6.7
GNP in billions	$157.9	$137.3	$5.5	$103.1	$220.0	$228.0[1]
GNP per capita	$20,485	$27,681[1]	$22,047	$24,316	$25,701	$33,979[1]
Inflation rate	3.3%	6.1%	15.5%	4.1%	10.5%	5.4%
Trade balance in millions	-$10,034	$768	$79.5	$7,625	$3,478	-$6,014
Persons per TV set	2.8	2.7	3.3	2.9	2.4	2.9

[1]GDP. [2]GDP per capita. [3]Has applied for EC membership.

Seeking Associate Status With the EC

	CZECHOSLOVAKIA	HUNGARY	POLAND
Population in millions	15.7	10.6	38.2
GNP in billions	$42.0	$31.1	$89.4
GNP per capita	$2,680	$2,940	$2,340
Inflation rate	16%	29%	684%
Trade balance in millions	-$5,386	-$2,375	$2,321
Persons per TV set	3.7	2.5	3.8

PORTUGAL	SPAIN
10.5	40.0
$59.5	$487.1
$5,647	$12,503
13.4%	6.7%
-$6,580	-$29,566
6.4	2.6

Having Trade Agreements With the EC

	ALBANIA	BULGARIA	ROMANIA	YUGOSLAVIA
Population in millions	3.2	8.9	23.2	23.9
GNP in billions	$2.0	$19.6	$42.3	$148.7
GNP per capita	$625	$2,220	$1,820	$6,210
Inflation rate	30%[1]	65%	75%	588%
Trade balance in millions	$40[1]	-$2,565	-$1,780	-$4,563
Persons per TV set	10.0	3.3	6.0	5.7

[1]1991 estimate.

JEAN HELD FOR FORTUNE / SOURCES: IMF, PLANECON, DRI, EMBASSIES

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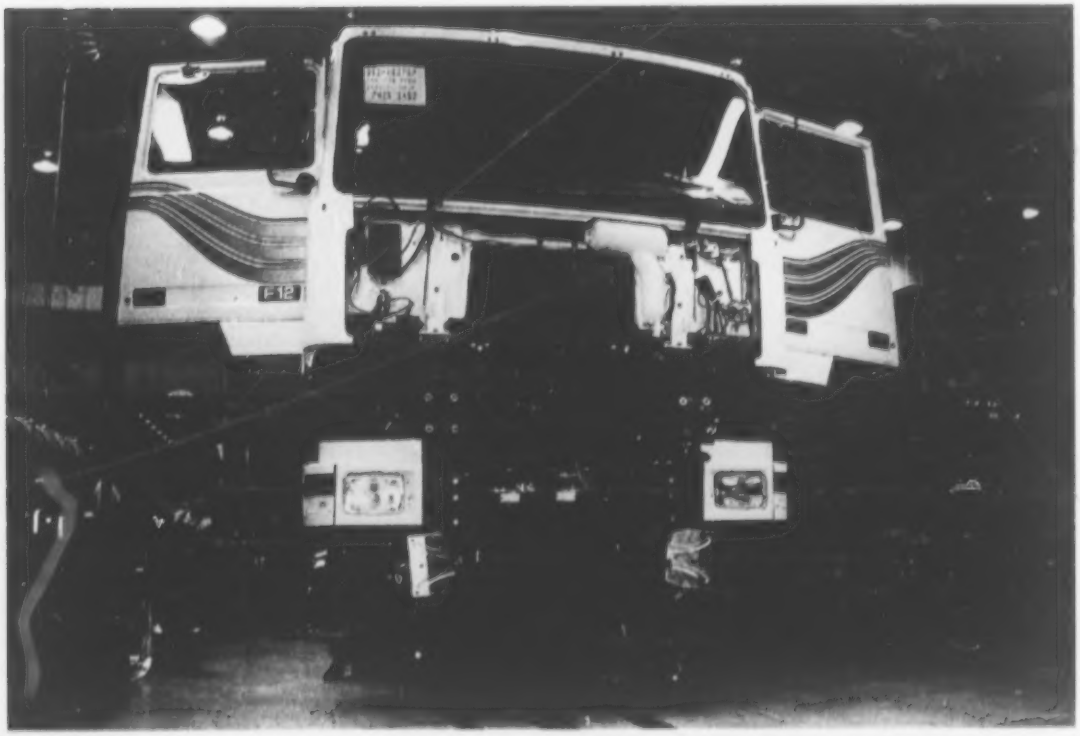
CAN EUROPE COMPETE?

Vital European industries like autos and electronics look wobbly. Needed: more aggressiveness, less provincialism, and the speedy adoption of lean manufacturing techniques.

■ *by Christopher Knowlton*



European carmakers are falling behind the Americans, let alone the Japanese, but they are world leaders in heavy trucks. This Volvo is being assembled in Ghent, Belgium.

HOW FAT, or fit, is European industry? Are Europe's big manufacturers, as protectionists there would have you believe, a bunch of nymphs, soon to be victims of invading satyrs in the form of foreign competitors? Or are they, as the free-marketers maintain, the lurking Tarzans of the global business jungle who need only beat their chests and ululate to repel intruders?

The question matters more than ever now because the emergence of a unified market has turned Europe into a such a furiously competitive battlefield. Entire sectors are being fought over by local companies and foreign multinationals. Hundreds of thousands of jobs are at stake and so, arguably, is Europe's enviably high standard of living.

The past few months have lent credence to the nymph scenario. Rover, the British car manufacturer, and France's Peugeot announced their retreat from the U.S. market. Britain's Rolls-Royce lost a $700 million British Airways jet engine order to American archrival General Electric. Philips, the Dutch electronics giant, pulled out of two big markets in Europe in favor of U.S. companies, selling its home appliance business to Whirlpool and its computer systems division to Digital Equipment. *continued*

REPORTER ASSOCIATE *Thomas J. Martin*

PHOTOGRAPH BY JOHN STURROCK—NETWORK/MATRIX

quickly and at amazingly low cost.

Though long aware of the threat from Japan, Europeans have yet to embrace the new methods. The MIT study puts it bluntly: "European companies have sought to perfect mass production as the Japanese have continued to perfect leanness, and they are much further behind than the Americans were in 1980—off the pace by a factor of three or four in many countries in terms of fundamental productivity."

THE SERIOUSNESS of this lag cannot be overstated. Europe's competitiveness in manufacturing will largely determine the quality of life for its people and its status as an economic power. Here's how Europe stacks up today against Japan and the U.S. in three of the world's most valuable industries: motor vehicles, electronics, and chemicals and pharmaceuticals.

■ **MOTOR VEHICLES.** The industry in Europe employs nine million people and accounts for 9% of manufacturing output. The EC runs a trade surplus with the rest of the world largely because it restricts Japanese imports and because Ford and GM build cars in Europe rather than import them from the U.S. Productivity (output per employee) increased about 39% between 1980 and 1988, thanks to restructuring and a heavy investment in robotics and new manufacturing processes.

It hasn't been enough. The Japanese competitive advantage is well known but bears repeating: They make cars with fewer defects, in smaller spaces, with workers who have twice as much training as their European counterparts and exhibit less than half the absenteeism. According to the MIT study, using data from 1989, the Japanese take 16.8 hours on average to produce a car in Japan; the Americans require 25.1 hours; the Europeans need 36.2 hours.

Perhaps most worrisome is the difference in product development times. The Japanese can design, develop, and deliver an entirely new car in 46 months, using an average of 1.7 million hours of engineering effort. The Europeans and Americans take 60 months and three million engineering hours. This means that product life cycles are shortening, which puts profit pressure on smaller, regional producers—the Europeans—who come to the market with fewer new models and older designs. Worse, it means that Japan's competitive advantage in cars is accelerating.

Currently the Japanese hold 11.6% of the European market, vs. 30% in the U.S. Stymied by quotas, they have just 3.5% in France and 2% in Italy. For how they might do, look at their share in countries without restrictions, such as Belgium (20.1%), Denmark (35.9%), and the Netherlands (26.7%). Japan's share in Europe as a whole is expected to reach 16% (including 9% of the French market) by the end of 1991 when, in theory, all restrictions will lapse.

Each of Europe's carmakers defends a market share of 9% to 15%. If Japanese companies take another 6% to 10% of the total, industry experts expect Fiat, Peugeot SA, and Renault to be hit hardest. Peugeot's recent retreat from the U.S. market, where it sold two luxury models, the 405 and the 505, underscores its problems. The competitive crucible of the U.S. market gives carmakers the experience and discipline needed to achieve worldclass standards, if they can take the heat.

The $105 billion automobile components industry suffers from a similar affliction. According to a study conducted for the EC by the Boston Consulting Group and PRS Consult-

HOW EUROPE'S COMPANIES COMPARE

Number of companies on Fortune's Global 500 by industry

INDUSTRY	EUROPE	U.S.	JAPAN
Aerospace	6	10	0
Apparel	0	2	0
Beverages	7	4	2
Building materials	8	5	3
Chemicals	18	14	9
Computers (including office equip.)	3	9	3
Electronics	10	16	15
Food	14	21	8
Forest products	6	12	5
Furniture	0	1	0
Industrial & farm equipment	13	8	6
Jewelry, silverware	0	0	1
Metal products	7	4	6
Metals	18	7	9
Mining, crude-oil production	7	0	0
Motor vehicles/parts	14	7	17
Petroleum refining	16	16	7
Pharmaceuticals	7	10	2
Publishing, printing	4	4	2
Rubber & plastics products	3	2	4
Scientific & photographic equip.	0	5	2
Soaps & cosmetics	3	3	2
Textiles	1	1	4
Tobacco	3	3	1
Toys, sporting goods	0	0	1
Transportation equipment	1	0	1
TOTAL	169	164	110

Bigness isn't always better, but it can provide two distinct competitive advantages—financial strength and economies of scale. Europe remains powerful in chemicals and pharmaceuticals, food and beverages, and refining.

Europeans may not be leaders in *making* many products anymore, but they sure ought to be able to paint them. The chemical giants of Europe dominate the world paint market. This ICI plant is in Slough, England.

ing International. Japanese producers have higher productivity and product quality, and faster design-development-delivery cycles. They also achieve more product variety at a lower cost.

A few automotive niches are healthy. Says Garel Rhys, an auto expert and professor at the University of Wales: "Cars get all the publicity, but Europe's real competitive advantage is in heavy trucks. It may be our best multinational industry." Daimler-Benz, Volvo, and Renault together have nearly 50% of the U.S. market. European buses sell equally well.

■ ELECTRONICS. The electronics industry, broadly defined, should grow faster than any other in Europe through the end of the century. On a worldwide basis its revenues should increase some 9% annually, or almost three times the rate predicted for the world economy. It is also the largest single industry in Japan, South Korea, and Taiwan. In 1988 Europe ran a $29 billion trade deficit in electronics.

As in carmaking, the plethora of national champions handicaps Europe: Siemens in Germany, Bull and Thompson in France, Olivetti in Italy, Philips in the Netherlands. Most lost money in 1990, and only Alcatel Alsthom, Siemens, and Philips have sales of more than $15 billion.

High-volume global companies like IBM, Compaq, Digital Equipment, and Apple easily took away most of the European market. ■

In computers, the largest segment of the industry, the Europeans have paid a high price for being small and parochial. Customer loyalty and national allegiance count for little when it comes to buying computer equipment. Over the past decade high-volume global companies like IBM, Compaq, Digital Equipment, and Apple easily took away most of the European market from local competitors.

The story isn't much happier in microchips, the heart of the electronics industry. Europe is fighting back with a government-backed consortium of companies known as Jessi (Joint European Submicron Silicon Initiative). The hope is to develop top-notch semiconductor know-how by 1996, in time for such new technology as high-definition television. And individual companies are launching joint ventures with foreigners on the principle if you can't beat them, join them: Siemens and IBM to build DRAMs, Philips and Matsushita to develop a remote-control device to operate different brands of TV sets, compact disk players, and video recorders.

Europe's electronic giants do excel at telecommunication and medical equipment. And European household appliances get high ratings for their design features and use of advanced plastics. The EC also has strength in TV color picture tubes, which account for 40% of the cost of a set. But the competitive advantage is only at the upper reaches of the market, in the fabrication of large flat square tubes. Cheap Korean sets have all but seized the low end.

Europe, led by Thorn Lighting, Philips, and Siemens, also remains world leader in light bulbs. Faster growth of imports over exports, however, in this segment suggests that Europe may be conceding its advantage.

European electronics producers have a good record as innovators. Philips developed the first compact disk player and now has ambitious

plans for a new generation of electronic products featuring the digital compact cassette, due out next spring or early summer. And European companies are competing hard to develop HDTV, although the Japanese are already producing hardware in limited, expensive amounts. The Europeans' best hope is to leapfrog the first generation of Japanese HDTV products.

Still, important as innovation may be in this market, there is no substitute for quick, lean manufacturing. Products like CDs, camcorders, and VCRs blow into stores, reach saturation levels in a few years, and then are replaced by the newer gadgets. The Japanese are superb at playing this fast-moving game.

■ CHEMICALS, PHARMACEUTICALS. Mop your brow, blow a whistle of relief. Here at last is an industry where Europe leads the world, running up a $27 billion trade surplus in the process. The chemicals sector is the third-largest industry in the EC after food and beverages, and motor vehicles. Size and financial strength are competitive advantages in this capital-intensive game because the bigger the company's global footprint, the better the economies of scale.

Europe is home to seven of the ten largest chemical companies: BASF, Bayer, Hoechst (all German), Imperial Chemical Industries (British), Rhône-Poulenc (French), Norsk Hydro (Norwegian), and Ciba-Geigy (Swiss). The other three are American: E.I. du Pont de Nemours, Dow Chemical, and Monsanto. The Japanese are primarily regional operators, in Asia and the Pacific Rim.

To dodge the cyclicality of their industry, most companies are expanding into specialty chemicals, where the margins are fatter and safer. Many of these products require extremely complicated manufacturing processes, as many as 30 steps for some chemicals. Oil is the chief foodstock, so there are competitive advantages to being connected to an oil company, as Shell Chemicals is with Royal Dutch/Shell Group.

Europe has great strength in the world paint market, but painimakers from the U.S., Japan, and India (UB Group), facing highly competitive markets at home, are stepping up their investments in Europe. Only one U.S. company, PPG, is among the top ten in Western Europe. Three European companies (ICI, BASF, and Akzo) are among the top ten paint suppliers in the U.S. According to *Chemical Outlook International*, they have 20% of the American market among them.

Europe also is the world's largest producer of pharmaceuticals. The industry benefits from an exceptionally strong scientific community in many countries. The companies are well managed and are doing what needs to be done to keep their competitive

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edge: spending heavily ($6 billion last year) on R&D and expanding internationally. Britain's Beecham bought SmithKline Beckman of the U.S. two years ago. Rhône-Poulenc bought 68% of Rorer last year. British-based Glaxo has been doing business in Japan for some 17 years and is stepping up its efforts there despite a distribution system that has been described as "more impenetrable than the Gordian knot." Says Chairman Sir Paul Girolami: "If we hadn't entered the Japanese and American markets, we wouldn't be independent now, and we wouldn't deserve to be."

Make no mistake, the Japanese are coming. The regulatory authorities in Japan are lowering the domestic prices of drugs, which will force companies to expand abroad. Already Japanese drug companies are taking small positions in Europe, buying up little companies that give them some local manufacturing and distribution, primarily in generic drugs.

Whether the Japanese succeed in Europe depends largely on their ability to establish effective distribution channels. Webs of regulations in each country have kept the market highly fragmented. The key, of course, is to foster good relationships with doctors and hospitals. Local European drugmakers have a huge head start.

Japanese drugmakers may gain some advantage from their facility at lean manufacturing. But Western manufacturing standards in this industry are high too, so the advantage may not be decisive. Says Richard Barker, a principal at McKinsey & Co.: "The Japanese are not going to overrun the European pharmaceutical market in the 1990s. Over the long term, though, there is no reason why they shouldn't get their share of worldwide markets in an industry that is inherently global."

■

As Europe's big producers maneuver for position in the single market emerging, there is a danger that they will overlook the landmark industrial developments transpiring in other parts of the world. They've done it before. As the authors of the MIT study write: "Early in this century, most Europeans were unable to differentiate the universal ideas and advantages of mass production from their unique American origins. As a result, ideas of great benefit were rejected for a generation. The great challenge of the current moment is to avoid making such an error twice."

To benefit fully from the opportunities at home and abroad, the Europeans must focus on raising their productivity and quality standards to those of the world's most competitive companies. To do that they must embrace teamwork, just-in-time inventory delivery, statistical quality control, and the other integrated techniques of lean manufacturing. And they must do so fast. ■

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STOCK TRADING WITHOUT BORDERS

The European Community's 12 exchanges are taking the first steps toward a more unified equity market. The technical and cultural obstacles are enormous. But so is the potential payoff.

■ *by Karen Nickel*

THE crowning jewel of Europe's economic integration will be a unified European capital market, where companies large and small can scoop up equity money anywhere in Europe, and investors from Dublin to Düsseldorf can buy shares from each other's countries cheaply and easily.

The architects of this megamarket envision a pan-European system that would deliver a share of Fiat as easily as one of Unilever to anyone, anywhere. Brokers from one country in Europe would operate freely in every city with a so-call'ed European Passport that would grant them all the privileges of a local firm.

The plan is a natural consequence of the steps currently under way to unite Europe's economic systems. But organizational blueprints aren't the only thing driving the move to a common capital market. Customers are demanding it. Cash-hungry companies throughout the EC are already looking beyond their national borders for markets that can provide low-cost equity financing. With many European banks emphasizing international growth over domestic lending, a lot of corporations that traditionally relied on banks for capital are now looking to the equity market for money.

A further gush of equity is expect-

The building housing Madrid's trading floor dates back to 1893. The computers that handle trades date from 1989.

PHOTOGRAPH BY ROBERT ROYAL

ed to come from thousands of private European companies started right after World War II. As the family heads of these small and medium-size firms step down without heirs interested in taking over, boards may seize the opportunity to take the companies public.

Demand for shares is also expected to surge in the years just ahead. Faced with an anticipated decline in interest rates, European pension funds will begin to look more at investing in stocks. And there will be more pension money to invest. In the U.S., some 70% of private sector savings is in the form of institutional pension funds. In Germany and France, it is less than 5%. But this number is expected to go up as an expanding legion of retirees forces companies to build up pension reserves. Says David Roche, an international strategist at Morgan Stanley in London: "Pension funds are about to become Europe's new growth industry." As pension assets swell, the demand for equities should surge.

The capital market envisioned for a united Europe would satisfy all these demands. It aims to have the EC's biggest companies cross-listed on all the major stock exchanges but to have companies report their financial statements only in their home countries. It would eventually include Europe's non-EC members, such as Switzerland and Austria. By making cross-border securities trading easier, Europe's planners hope to stimulate growth in all the equity markets.

Europe's stock markets can use the boost (see the market capitalization numbers below). With the exception of London, which has more listed stocks than New York's Big Board, most European markets are underdeveloped relative to the size of their economies. They currently have some of the lowest equity-to-GDP ratios in the world, and the few stocks listed totally dominate their exchanges. The market value of the top ten domestic stocks on the New York and Tokyo exchanges amounts to only 15% to 20% of their respective markets' total capitalization. But in Germany, Belgium, Spain, and Italy, the top ten stocks account for about 50% of the market, and Amsterdam's corresponding figure is 80%.

With the exception of London, most European markets are underdeveloped relative to the size of their economies. ■

So far the small movements toward market integration have been as harmonious as merging a punk rock band with a classical string quartet. The ambitious designs are being slowed by national rivalries, out-of-date market regulations, language barriers, and local corruption.

European stock markets can overcome such obstacles. Indeed, Europe's bond market has successfully transcended national boundaries. Integrating the equity markets will not be so easy. The bond market is wholesale—institutional investors move quickly and quietly, practically without government regulation. The only goals are liquidity and transactions at the lowest cost.

But equity markets serve small investors too. That means there must be laws to protect the little guys, as well as regulations to require institutions to reveal more about their dealings—something regulators call "market transparency."

That's easier said than done. Though some markets, like Paris's, are highly transparent, revealing volumes and prices within seconds of a trade, others, like Milan's, remain mired in outmoded practices that keep information from reaching investors quickly. Nearly three-quarters of Italy's stock trades are made off-market by banks and brokers, which privately match customers' orders. Price information on these trades may not be available until the next day. Italian authorities say that should change in 1992.

So, too, if small investors are to have confidence in markets, governments will have to tighten regulation and enforcement. In Germany the legislature is only now considering a formal law to ban insider trading. Other countries have their own problems: The Milan stock exchange has dealt with two cases of large-scale fraud in recent months.

The European Commission, which is overseeing plans for Europe's economic union, has drawn up some

Reporter Associate Noel E. Field

How Europe's Markets Stack Up

STOCK MARKET	MARKET CAPITALIZATION $ billions	% OF EUROPE'S MARKET CAP	ANNUAL VOLUME $ billions	NUMBER OF COMPANIES LISTED
London[1]	$861.9	41.6%	$305.6	1,946
German exchanges[2]	$356.4	17.2%	$544.2	413
Paris	$306.7	14.8%	$123.0	443
Milan	$149.1	7.2%	$45.7	220
Amsterdam	$125.8	6.1%	$43.7	125
Madrid	$123.5	5.9%	$38.9	431
Brussels	$65.7	3.2%	$7.3	176
Copenhagen	$39.1	1.9%	$12.0	248
Athens	$15.4	0.7%	$4.0	140
Luxembourg	$10.5	0.5%	$0.2	54
Dublin[1]	$10.4	0.5%	$3.0	51
Lisbon	$9.0	0.4%	$1.3	152
New York	$2,819.8	N.A.	$1,336.2	1,774
Tokyo	$2,793.6	N.A.	$1,375.1	1,627

[1]Includes domestic shares only. [2]Consists of Frankfurt and seven other regional exchanges.

The combined capitalization of all EC markets is just over $2 trillion, putting it in a league with New York's and Tokyo's. The listing of funds set up to raise money for Germany's reunification helped boost trading volume last year.

The Frankfurt exchange handles about 60% of the trading volume in Germany, with the rest going to seven smaller exchanges throughout the country. Frankfurt is the country's main exchange for international stock trades.

guidelines for the exchanges but has little power to enforce them. EC officials are counting on market forces to prompt wayward exchanges to clamp down. They believe that once the unified market is established, trading will probably drift away from exchanges that do not adhere to EC standards.

Despite these difficulties, Europe's financial market chiefs are making some headway. The next big step toward market unification will take place when the EC's member exchanges approve Eurolist, a proposed cross-listing of over 250 of Europe's blue-chip companies on all exchanges in the EC. Though some EC countries are urging delays in the Eurolist launch, optimists hope it can get off the ground in the next year or two. Some 50 well-known European companies, like Bayer and Royal Dutch Shell, are already listed on several exchanges within the EC. But it takes myriad listing fees and mounds of paperwork to satisfy each nation's financial reporting requirements. One European company that trades on six different exchanges reports that its annual listing fees for all these exchanges total $50,000 to $60,000, and the cost of meeting the differing disclosure requirements amounts to nearly $1 million a year.

Eurolist would reduce listing charges to a single fee and allow companies to satisfy all reporting requirements by simply meeting their home country's reporting rules. It would also be a boon for European investors, since it would allow them to buy stocks outside their home market without paying extra commissions.

THOUGH SUCH STEPS are designed to foster cooperation among EC exchanges, they have lately been stirring competition. With Eurolist, for example, trading of a company's shares is expected to remain largely in its home market—German investors would buy Siemens stock on one of the country's eight exchanges. But other exchanges would compete for an increasing share of the international trading volume in these stocks, most of which now goes through London. Britain's market planners expect to retain a substantial part of its European business because of the London Stock Exchange's computerized trading system for international stocks, called SEAQ International. It can swiftly handle trades in more than 600 international stocks. But the competition is heating up. Germany, which boasts the highest domestic trading volume in Europe, has developed its own trading technology, known as IBIS, which allows for immediate transmission of trading data to the exchange's clearing system. France is tooling up its exchange as well with a new computerized clearing and settlement system that began operation this year. Most of Europe's other exchanges are on the computer bandwagon as well.

The heavy investments in technology are making a big dent in the exchanges' budgets. Says one official in Paris: "We have a very difficult situation. Trade volumes are low, fixed costs of stockbrokers are high, and we have to invest in new systems and rack our brains on what strategy we need."

The technological advances will bring gains. Even if these systems aren't as compatible with those in other countries as everyone would like, they will greatly increase the ability of the various markets to handle big trades and to settle those trades in an acceptable time. That will enhance the attractiveness of Europe's smaller markets, like Dublin and Lisbon, where the biggest obstacle to investment has been a lack of liquidity. Spain was a backward market in the mid-Eighties, but heavy investment in technology has made it a more hospitable place for international investors. It is now viewed as one of the most promising places to invest in Europe (see Personal Investing).

Europe's exchanges are still searching for the middle ground between competition and cooperation. Balancing these two ideas is critical to the success of Europe's financial services industry. Whether Eurolist succeeds, says Malcolm Duncan, an international stock market consultant, "depends on whether European or national priorities have the upper hand." Each exchange is rightfully proud of its own developments and reluctant to submit to the rules and technology of other countries. Ultimately, alliances will have to be forged, and certain technologies will win out. Though some markets will gain more than others, the longer-term benefits of integration will flow to all. F